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Introduction

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BS 8524-1:2023, Active fire curtain barrier assemblies – Part 1: Specification

IMPORTANT INFORMATION

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Foreword

Publishing information

This part of BS 8524 is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on XXX 2023. It was prepared by Technical Committee FSH/25, *Smoke, heat control systems and components*. A list of organizations represented on this committee can be obtained on request to the committee manager.

Supersession

This part of BS 8524 supersedes BS 8524-1:2013, which is withdrawn.

Relationship with other publications

This British Standard was developed from PAS 121, which was withdrawn on 31 July 2013. This British Standard is published in two parts:

- Part 1: *Specification*;
- Part 2: *Code of practice for application, installation and maintenance*.

BS 8524-2:2023 gives guidance on specifying, installing and maintaining active fire curtain barrier assemblies, with recommendations for different assembly applications, wiring, power supplies and the emergency egress control.

Information about this document

This is a full revision of the standard, and introduces the following principal changes:

- side retention has been updated with a supporting figure;
- references to ISO 21524 and BS EN 15269-11 have been included;
- barrier types have been updated to reflect market supply;
- pressure and impact testing has been updated to force gauge methodology;
- horizontal and angle barriers have been included with supporting text and figures;
- durability of self-closing levels have been updated;
- reaction to fire to be classified to BS EN 13501-1 has been included and national requirements for Class 0 or Class 1 have been deleted;
- Annex D has been updated to strengthen gravity fail-safe testing requirements;
- Annex G has been updated to clarify time/temperature requirements.

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It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

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0 Introduction

0.1 Role and use of barrier assemblies

As fire-separating elements, barrier assemblies are required to provide two main functions:

- a) to maintain any compartmentation of buildings needed to limit the spread of fire and smoke;
- b) to allow access to protected escape routes, both vertical and horizontal, without any loss of fire resistance, and to limit smoke entry into these routes, i.e. protected corridors and protected shafts.

They can also be partially deployed to control the movement of fire effluent within buildings in the event of fire, prior to being fully deployed as a fire barrier.

Recommended positions and ratings for fire-separating elements for means of escape purposes are given in BS 9999:2017, BS 9991 and BS 7974. The recommendations in BS 9999:2017 and BS 9991 use a risk-based approach; those in BS 7974 are based on the principles of fire safety engineering.

When used as part of a fire-engineered design solution, barrier assemblies can become a critical element of that design. If barrier assemblies do not deploy to their operational position, the fire-engineered design solution would be compromised. However, in the event that

other fire protection systems or elements do not function, e.g. due to total power failure, the barriers in the fire-operational position provide fire separation.

0.2 Application of barrier assemblies

Barrier assemblies used in life safety and property protection applications can be horizontal, vertical or angled. Depending upon the application, they could be used to replace fire doors, roller shutters, non-load-bearing walls, non-load-bearing ceilings, glazed elements, etc. They could also be used to form fire separation, e.g. forming protected routes or lobbies. They can provide some of the functionality of a fire door, but when used only for fire and smoke control, as a fire door, then different requirements apply lobbies (see BS 9999:2017 and BS 9991). See BS 9999:2017 and BS 9991. Barrier assemblies can enable greater barrier widths and barrier movements using less space than other traditional methods. Recommendations on the suitability, selection, installation and maintenance of barrier assemblies are given in BS 8524-2:2023.

0.3 Deployment of barrier assemblies

Some examples of how barrier assemblies could be deployed are:

- a) barriers deploy fully upon receipt of a signal from the fire alarm system;
- b) barriers remain retracted when the fire alarm system is activated and only deploy upon receipt of a signal from a local smoke/heat detector. In these circumstances, the only barrier assemblies to deploy are those where fire or smoke are in the vicinity;
- c) barriers deploy upon local thermal activation, e.g. upon parting of a fusible link;
- d) barriers remain retracted when the fire alarm system is activated for a predetermined time to allow for evacuation before deploying fully;
- e) barriers move to a given height above finished floor level when the fire alarm system is activated to contain smoke for a predetermined time before closing fully for fire containment;
- f) barriers move to a given height above finished floor level when a specific fire alarm system signal is provided to contain smoke when the fire location is such that the barrier assembly is not required to deploy fully;
- g) barriers deploy on loss of primary and auxiliary power supply.

NOTE Further information on the deployment of barrier assemblies is given in BS 8524-2.

0.4 Heat transfer through barrier assemblies

In fire safety situations, it is often important to establish the heat transfer from one side of the separating element to the other in order to calculate escape route sizes and safe operating distances. Traditionally this has been established using insulation and radiation measurements. Further information regarding the application of radiation test data can be found in BS 8524-2:2023.

1 Scope

This part of BS 8524 specifies requirements for the design, testing and classification of active fire curtain barrier assemblies, for installation in accordance with BS 8524-2:2023. It covers the reliability and durability, fire resistance, smoke containment and force gauge resistance performance of the active fire curtain barrier assemblies, their control devices and ancillary equipment.

The requirements within this part of BS 8524 are applicable to active fire curtain barrier assemblies of any material that are designed to provide fire resistance.

This document does not apply to the following, which are intended for a different use:

- barriers made of part of the building's structure;
- theatre/proscenium textile curtains according to BS 5867-1;
- fabrics for curtains, drapes and window blinds according to BS 5867-1 and BS 5867-2; and
- smoke barriers according to BS EN 12101-1.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes provisions, or limits the application, of this document¹⁾. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 476-20, *Fire tests on building materials and structures – Part 20: Method for determination of the fire resistance of elements of construction (general principles)*

BS 476-22, *Fire tests on building materials and structures – Part 22: Methods for determination of the fire resistance of non-loadbearing elements of construction*

BS 476-31.1, *Fire tests on building materials and structures – Part 31: Methods for measuring smoke penetration through doorsets and shutter assemblies – Section 1: Method of measurement under ambient temperature conditions*

BS 5839 (all parts), *Fire detection and fire alarm systems for buildings*

BS 8524-2:2023, *Active fire curtain barrier assemblies – Part 2: Code of practice for application, installation and maintenance*²⁾

BS 9991, *Fire safety in the design, management and use of residential buildings – Code of practice*

BS 9999:2017, *Fire safety in the design, management and use of buildings – Code of practice*³⁾

BS EN 54 (all parts), *Fire detection and fire alarm systems*

BS EN 1363-1, *Fire resistance tests – Part 1: General requirements*

BS EN 1363-2, *Fire resistance tests – Part 2: Alternative and additional procedures*

BS EN 1366-7, *Fire resistance tests for service installations – Part 7: Conveyor systems and their closures*

BS EN 1634-1:2014+A1:2018, *Fire resistance and smoke control tests for door, shutter and openable window assemblies and elements of building hardware – Part 1: Fire resistance tests for doors and shutter assemblies and openable windows*

BS EN 1634-3:2004, *Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware – Part 3: Smoke control test for door and shutter assemblies*

BS EN 12453:2001, *Industrial, commercial and garage doors and gates – Safety in use of power operated doors – Requirements and test methods*

BS EN 13501-1, *Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests*

BS EN 13501-2:2016, *Fire classification of construction products and building elements – Part 2: Classification using data from fire resistance tests, excluding ventilation services*

¹⁾ Documents that are referred to solely in an informative manner are listed in the Bibliography.

BS EN 13823, *Reaction to fire tests for building products – Building products excluding floorings exposed to the thermal attack by a single burning item*

BS EN ISO 1182, *Reaction to fire tests for products – Non-combustibility test*

BS EN ISO 1716, *Reaction to fire tests for products – Determination of the gross heat of combustion (calorific value)*

BS EN ISO 13943, *Fire safety – Vocabulary*

ISO 21524:2021, *Fire-resistance tests – Elements of building construction – Requirements for active fire curtains*

3 Terms and definitions

For the purposes of this part of BS 8524, the terms and definitions given in BS EN 13501-1, BS EN ISO 13943 and the following apply.

3.1 active fire curtain barrier assembly (barrier assembly)

assembly manufactured from flexible materials, not hinged or pivoted, provided for the passage of persons, air and objects, which, together with its frame as installed in a building, is intended (when closed) to resist the passage of fire

NOTE For ease of reference, the active fire curtain barrier assembly is referred to as the “barrier assembly” throughout this British Standard.

3.2 barrier assembly with smoke resistance performance

assembly manufactured from flexible materials, not hinged or pivoted, provided for the passage of persons, air or objects, which together with its frame as installed in a building is intended (when closed) to resist the passage of fire and smoke

3.3 barrier movement

travel distance of a barrier assembly from its retracted position to its fire-operational position

3.4 compartmentation

process of separating a building or part of a building, into one or more rooms, spaces or storeys, with the intention of preventing the spread of fire to or from another part of the same building or adjoining building

NOTE 1 Compartmentation is mainly implemented to assist the fire and rescue services by confining the fire within a fire-resisting enclosure. In some instances it is employed to assist means of escape in buildings where evacuation might be delayed, e.g. where phased evacuation policy has been applied in premises such as hospitals and care homes or where a policy of non-evacuation (e.g. “defend in place” or “stay put strategy”) is employed as in blocks of flats.

NOTE 2 Fire enclosures specifically for the purpose of means of escape, such as lobby protection to stairways and enclosure of special risks, are not regarded as compartments and may employ passive smoke containment measures.

3.5 deployment

movement of a barrier assembly from its retracted position to its fire-operational position

3.6 fire-operational position

final configuration of a barrier assembly specified by its designer to achieve and be sustained in the ultimate fire condition of the design

3.7 fire separation

method of providing an element that is intended for use in maintaining separation between two adjacent areas of a building in the event of a fire to form protected routes and/or compartmentation

3.8 fire service override switch

manually operated switch to enable fire-fighters to initiate or terminate the operation of a fire safety system or other device

3.9 fusible link

device that releases a component such as a fire damper or fire shutter at a set temperature

NOTE This usually incorporates either a solder link or a frangible glass bulb.

[SOURCE: BS 9999:2017, **3.62**, modified – note has been changed]

3.10 gravity fail-safe

ability of a barrier assembly to move to its fire-operational position in a safe and controlled manner to facilitate fire separation when all consumable primary and auxiliary power supplies are removed, in the event of wiring or system corruption, open or short circuit, or any combination thereof

3.11 hold-open device

element of the hold-open system that allows a gravity fail-safe barrier assembly to remain open either at a pre-set or chosen position until released

3.12 life safety application

application of the barrier assembly in its fire-operational condition for the period of time required for the occupants of the premises to be alerted, and to be able to exit the premises, with the barrier assembly assisting in the protection of the means of escape and access for the fire and rescue service

3.13 material fabric

product made from fibres

NOTE For recommendations for testing material fabrics see 5.6.

3.14 means of escape

means whereby a safe route (or routes) in the event of fire is (or are) provided for persons to travel from any point in a building to a place of ultimate safety

[SOURCE: BS 9999:2017, **3.76**]

3.15 multi-positional deployment

staged movement of barrier assemblies to provide initial smoke containment prior to full fire containment

3.16 side retention

retention device which links the barrier fabric to the building structure to contain fire and smoke

3.17 smoke barrier

device to channel, control and/or prevent the migration of smoke

NOTE Smoke is often referred to as “fire effluent”. Smoke barriers can also be referred to as smoke curtains, smoke blinds or smoke screens. These are specified in BS EN 12101-1.

4 Barrier assembly design

4.1 General

The barrier assembly shall be designed and manufactured to create a fire-separating element in a horizontal, vertical or angled orientation.

NOTE 1 Typical uses of the barrier assembly include:

- a) *compartmentation;*
- b) *creating protected routes for the purpose of means of escape where using standard fire doors/shutters and non-load-bearing walls and ceilings would be prohibitive to the design;*
- c) *Protecting a non-fire resisting component in a fire resisting wall etc.;. a curtain could be used in front of such elements to provide the necessary fire resisting standard, e.g. in front of non-fire-resisting glazing and doorsets in an historic building, where required for compartmentation or protecting means of escape;*
- d) *meeting the requirements for smoke leakage in conjunction with other non-smoke rated products (e.g. lift door) protecting openings to reduce leakage of smoke.*

Further information on the uses of barrier assemblies is given in BS 8524-2:2023.

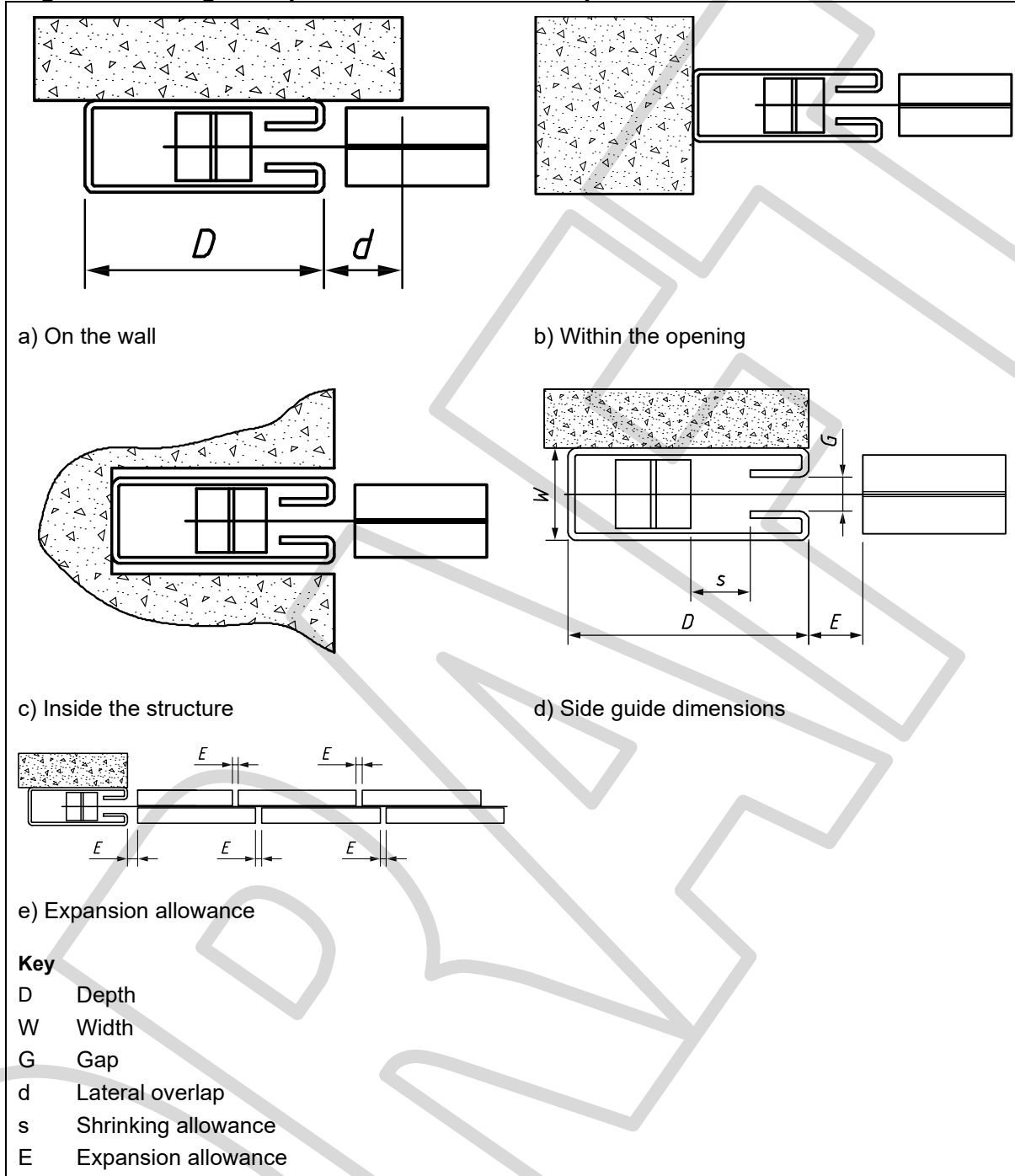
NOTE 2 Operable fabric curtains when used as fire door sets should also comply with BS 9999:2017 and BS 9991.

4.2 Side retention

4.2.1 Barrier assemblies, whether single or multiple barrier units, that are reliant on side retention as part of their integral design, shall have no gaps between the fabric edge and the leading edge of the retention guide that would fail integrity (see **5.6.2**).

NOTE Barrier assemblies having side tabs (retention device which is fixed to, and extends beyond, the edge of the barrier assembly but is not integral to the barrier assembly itself) have been found in some circumstances to produce edge gaps in end-use applications (see Figure 1).

Figure 1 – Side guide options and bottom bar expansion



4.2.2 During installation side-retention shall be used that is identical to the tested samples. Where mechanical fixings are used at the side fabric edges to assist in retaining the fabric edge within the side retention system, these shall be as used in practice and shall be the identical type, size, pitch, and position on all relevant specimens.

4.3 Additional requirements for multiple barrier assemblies

4.3.1 Where multiple single barrier assemblies are used to create a larger barrier assembly, they shall be overlapped and shall be continuously conjoined at the bottom edge.

NOTE 1 Figure 2 illustrates an example of the overlapping and conjoining of barrier assemblies. This configuration would not be suitable for use on an escape route (see BS 8524-2:2023, Figure 1).

NOTE 2 Figure 3 illustrates examples of typical overlapping barrier assemblies.

Figure 2 – Overlapping and conjoining of barrier assemblies – typical example

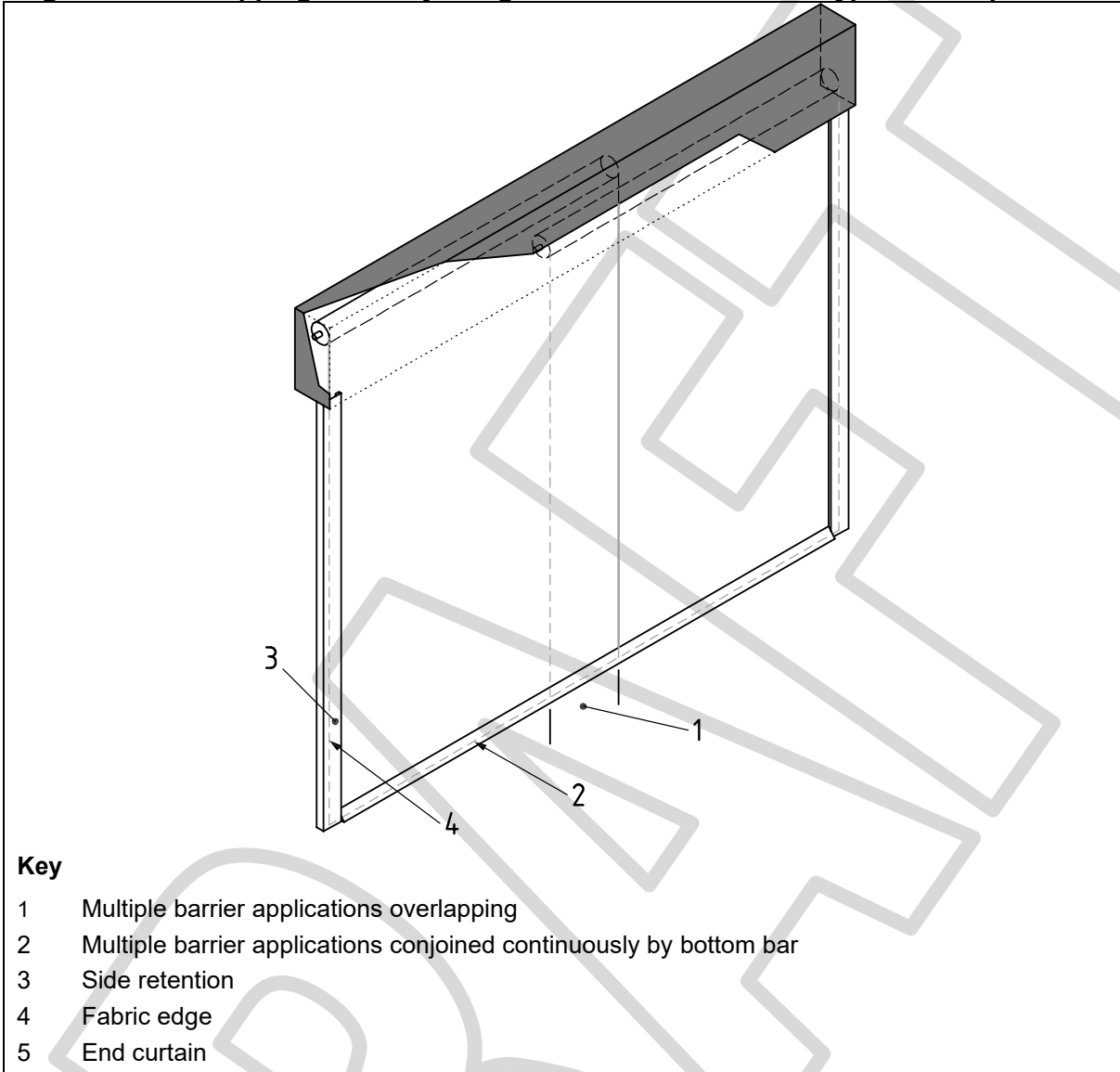
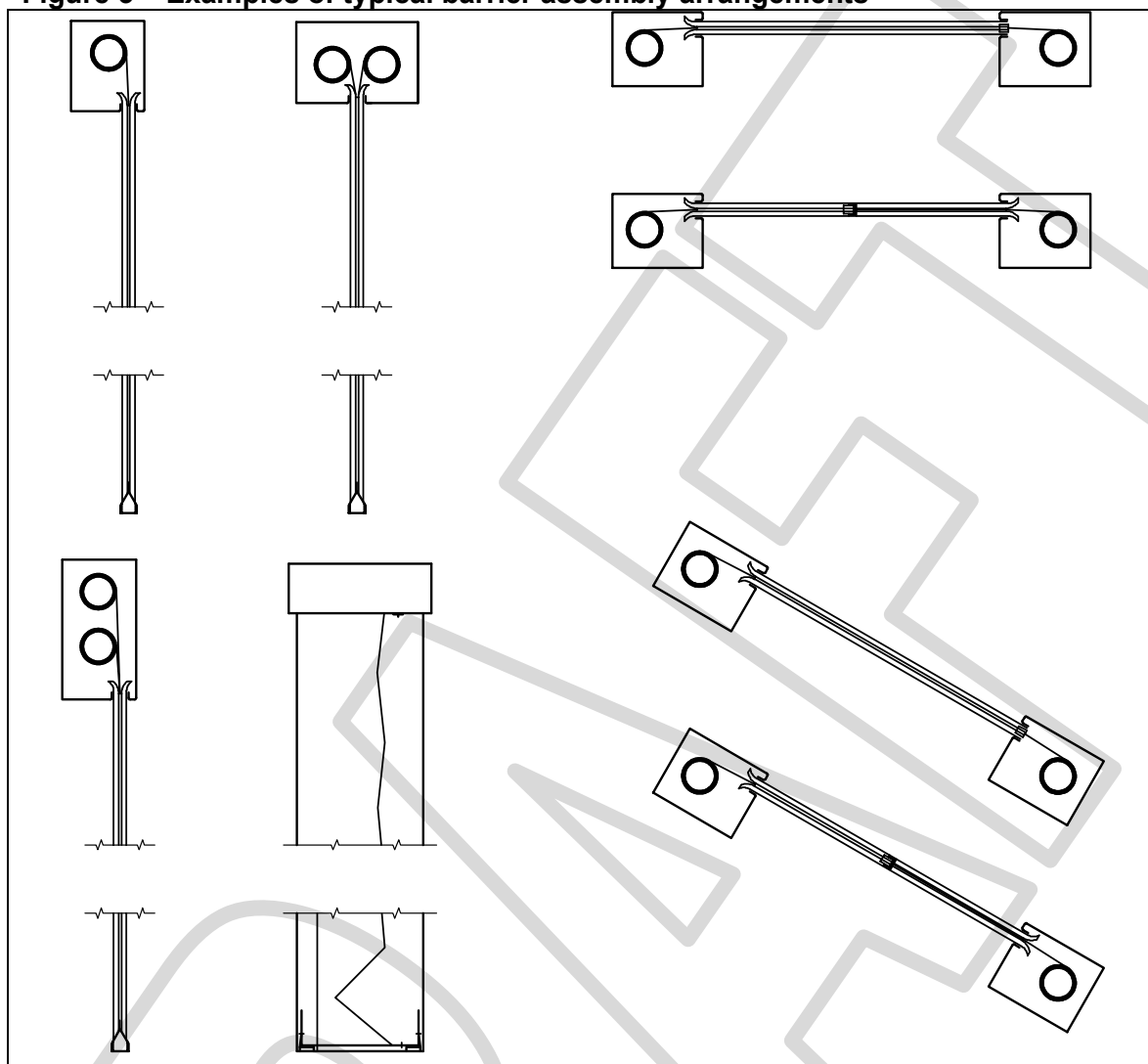


Figure 3 – Examples of typical barrier assembly arrangements



4.3.2 The amount of overlap required for assemblies other than the tested size shall be determined in accordance with Annex A and BS EN 15269-11.

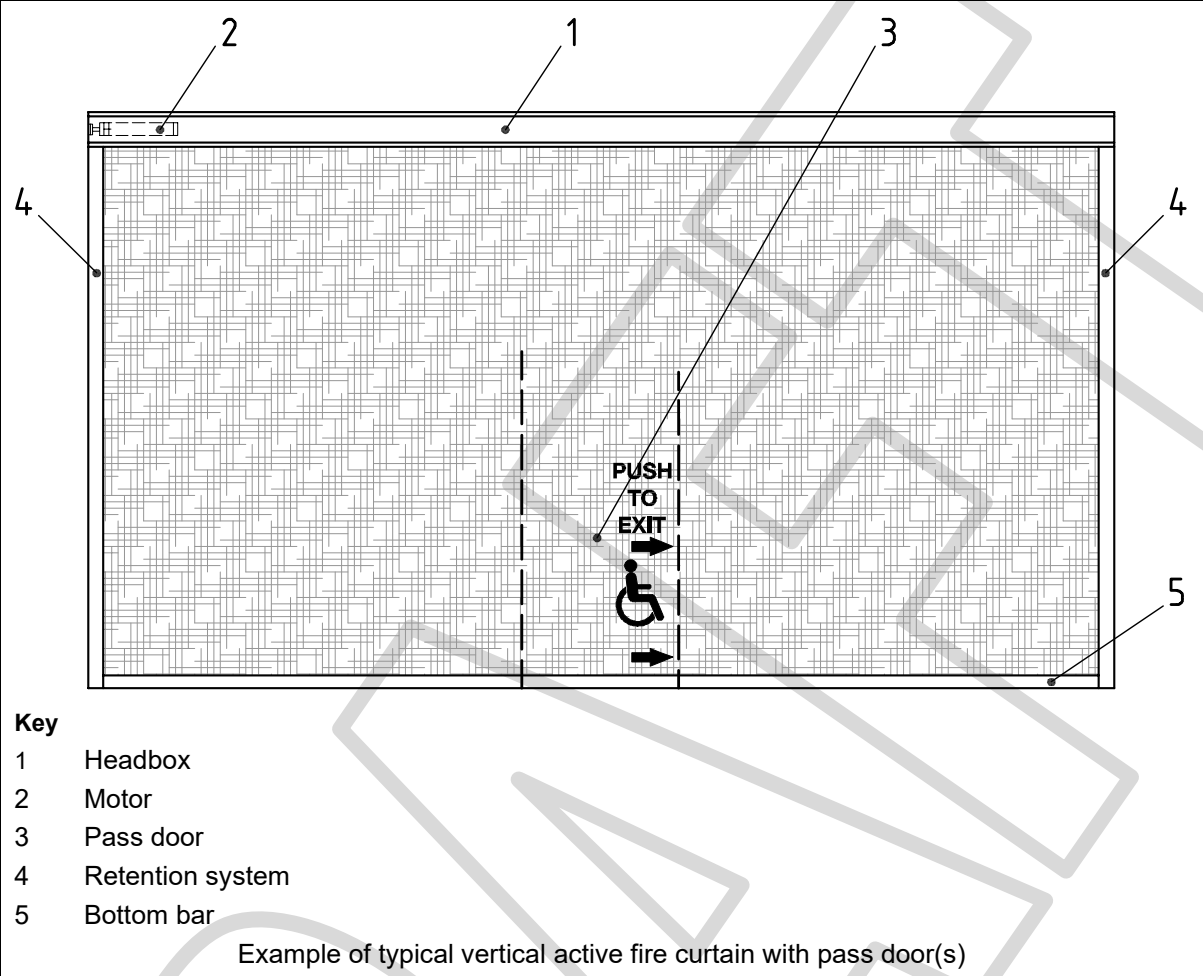
4.3.3 For barrier assemblies larger than those tested, supporting assessment evidence shall be provided which specifies the necessary overlap dimensions.

NOTE The necessary overlap generally increases with the drop.

4.3.4 The following types of fire barriers systems shall additionally conform to ISO 21524:2021:

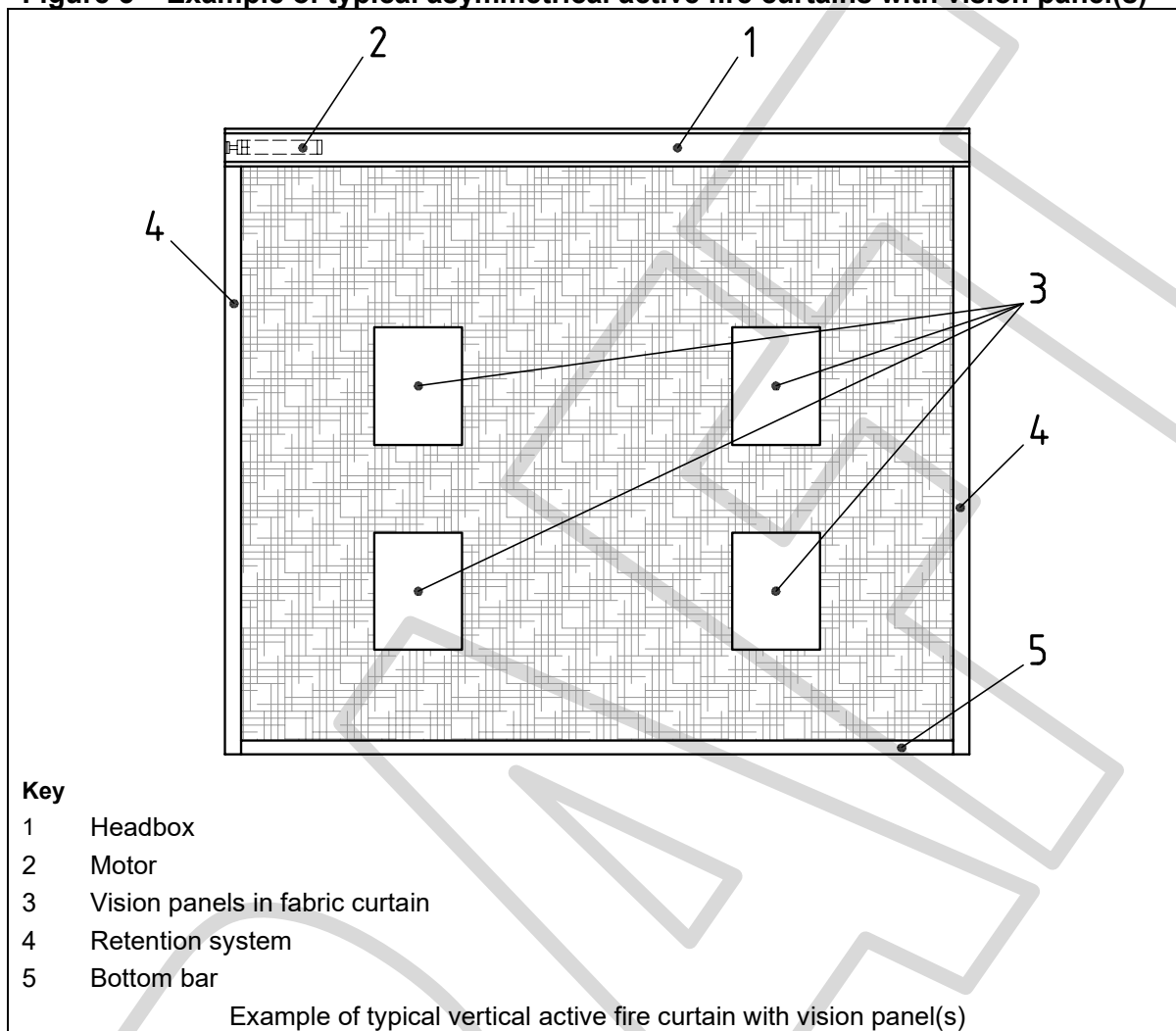
- horizontal and angled (see Figure 1);
- pass doors (mechanical pre-test conditioning; see Figure 4 and Table 3); and
- vision panels (see Figure 5).

Figure 4 – Pass doors



4.3.5 Barrier systems that include vision panel(s) shall conform to ISO 21524:2021, **5.6** (see Figure 5).

Figure 5 – Example of typical asymmetrical active fire curtains with vision panel(s)



5 Performance requirements

NOTE 1 The performance characteristics and levels of the barrier assembly are summarized in Table 1.

NOTE 2 The fabric used with the construction of the barrier assembly is critical to its performance.

Table 1 –Summary of performance characteristics

Performance measure	Related subclause	Test method(s)	Performance level
Durability and force gauge	5.2	5.2.2.1	SD
Reliability and durability of barrier assembly	5.2.1	Annex D	C0–C5
Reliability/durability of alternative or additional motor	5.2.2	Annex E	C0–C5
Response time and velocity	5.3.1	Annex D	Vertical: ≥ 0.06 m/s at any height; ≤ 0.15 m/s below 2 m Horizontal: ≥ 0.06 m/s at any height; ≤ 0.3 m/s below 2 m
Smoke containment:			

smoke leakage, where applicable	5.4	BS 476-31.1 or BS EN 1634-3:2004	S _a or S
Fire resistance:	5.5	Table 3	E, I and/or W
integrity	5.5.2		plus time (min) or time (min)
insulation, where applicable	5.5.3		plus integrity, insulation
radiation, where applicable	5.5.4		and/or radiation
Deflection zone	5.5.5	BS EN 1634-1:2014+A1:2018	Distance (mm)
Motor operation, where applicable	5.5.6	Annex G	Pass/fail
Reaction to fire	5.6	BS EN 13501-1 ^{A)}	B-s3,d2 or C-s3,d2
Ancillary equipment, where applicable	5.7	Annex H	Pass/fail

^{A)} This standard is a classification standard that specifies test methods.

5.1 General

5.1.1 When tested in accordance with **5.2**, **5.3**, **5.4** and the relevant parts of **5.5**, **5.6** and **5.7**, the barrier assembly shall meet the pass criteria specified in those subclauses.

NOTE Whilst some tests and equipment are optional, the exclusion of some of these might limit the application of the barrier assemblies in accordance with BS 8524-2:2023.

5.1.2 Tests shall be undertaken in the order specified in Annex B.

5.2 Durability and force gauge

5.2.1 Non-vertical orientations, e.g. horizontal or angled

5.2.2 The specimens shall be orientated as they would be in practice and the following tests shall be applied.

The centre of the pressure plate shall be applied to the specimen with a force of 400 N (+ 10 N , - 0 N). The pressure plate shall be applied for 3 s, held for a minimum of 5 s, and withdrawn within 3 s. This step shall be repeated three times at each of the locations, on each curtain panel within the specimen:

- 200 mm in from the face of the side channel and 200 mm in from the innermost face of the headbox;
- 200 mm in from the face of the retention system at mid-length;
- 200 mm in from the face of the retention system and 200 mm in from the innermost edge of the closing edge bar;
- 200 mm in from the innermost edge of the closing edge bar at mid-length; and at the centre of the curtain panel.

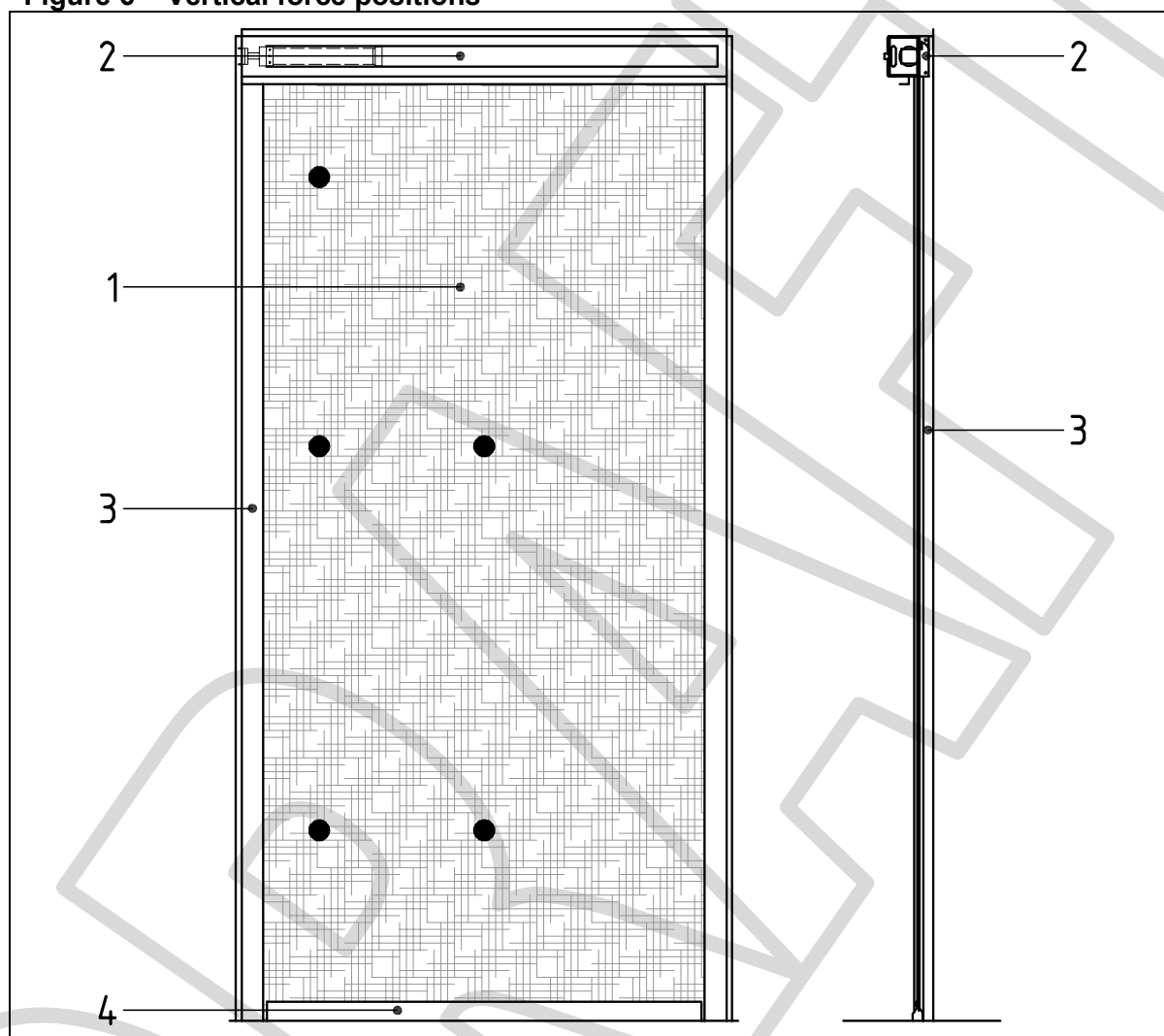
5.2.3 Gap gauges used to measure any gaps shall conform to **D.3.1**.

5.2.4 Following the initial force test, the barrier assembly shall undergo testing for reliability and durability in accordance with **5.3**, and deployment in accordance with **5.4**. A second force test shall then be undertaken on the same barrier assembly, in accordance with **5.2.1** or **5.2.2**, and **5.4.2.1**.

5.2.5 The deflection criteria shall not be used to determine failure of the barrier assembly following each impact test.

5.2.6 When a specimen of the barrier assembly conforming to ISO 21524:2021, Annex J is tested for durability and force, gap gauges shall be used to measure any gaps, cracks or tears that develop between the fabric and beyond the retention device (retention system) shall be recorded. Force gauges shall be applied in accordance with Figure 6 and **5.2.2.1**.

Figure 6 – Vertical force positions



5.3 Reliability and durability

5.3.1 When tested in accordance with Annex D, the barrier assembly shall complete without failure the number of cycles that are relevant to the intended classification in Table 2 (see D.5). It shall subsequently be classified in accordance with Table 2 according to the test result obtained.

NOTE A successful test for a given number of cycles also covers all classifications for lower numbers of cycles. e.g. Class C3 also covers classes C1 and C2.

Table 2 – Durability of self-closing

Frequency of intended use	Minimum number of cycles	Class
No performance determined	0	C0
Retained in the open position	1 000	C1

Low frequency of use by those with high incentive to exercise care	10 000	C2
Medium frequency of use primarily by those with some incentive to exercise care	50 000	C3
High frequency of use by public with little incentive to exercise care	100 000	C4
Subject to very frequent usage	200 000	C5

5.3.2 When tested in accordance with Annex E, alternative or additional motors to those tested as part of the barrier assembly shall complete without failure the number of cycles that are relevant to the intended classification in Table 2. They shall subsequently be classified in accordance with Table 2 according to the test result obtained.

5.4 Deployment

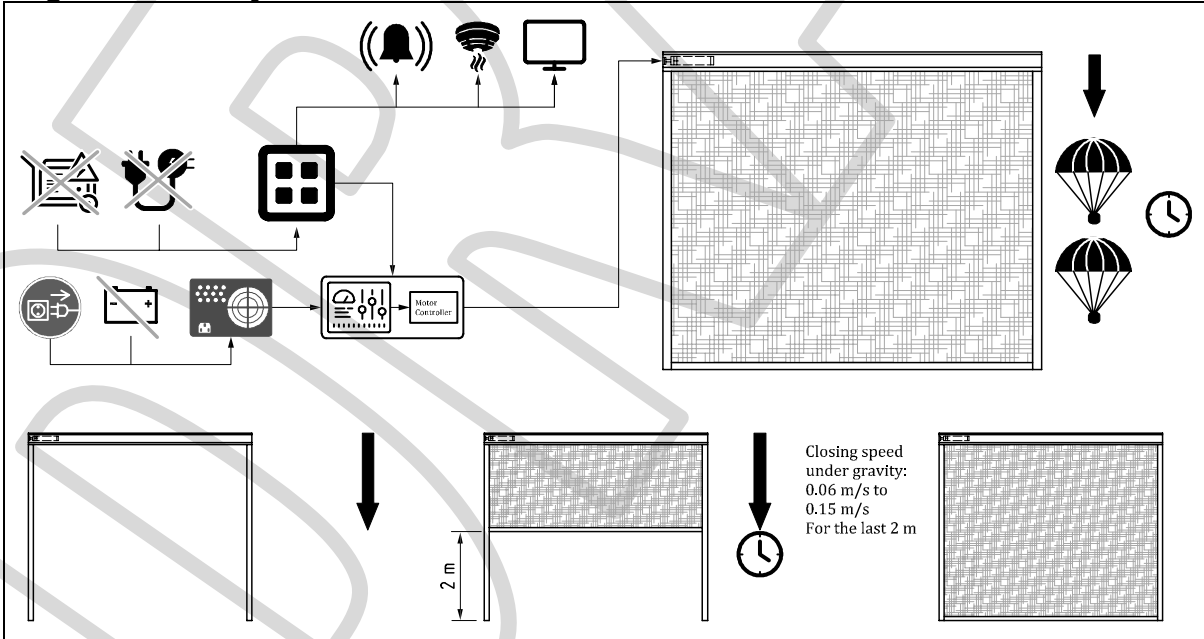
5.4.1 Response time and velocity

5.4.1.1 When tested in accordance with Annex D, the barrier assembly shall commence deployment within 3 s of receipt of an initiation signal and move to its fire-operational position in all operating modes.

5.4.1.2 The barrier assembly shall have a velocity of not less than 0.06 m/s. Within 2 m of floor level, the velocity shall be not more than 0.15 m/s for vertical movement or 0.3 m/s for horizontal movement.

All vertical barrier assemblies shall be gravity fail-safe. For vertical barrier assemblies, and for non-vertical barrier assemblies that are capable of gravity fail-safe, when all consumable primary and auxiliary power sources are removed, or in the event of wiring or system corruption (e.g. open or short circuit, or any combination thereof), the barrier assembly shall gravity fail-safe to the fire-operational position, in a controlled manner and within the relevant velocity range, as specified in 5.4.1.2 (see Figures 7 and 8).

Figure 7 – Gravity Fail Safe



5.4.1.3 For non-vertical (e.g. horizontal or low-angle) barrier assemblies that do not permit fail-safe by gravity, a power supply for life safety equipment for fire protection shall be provided in accordance with BS 9999:2017. For non-vertical (e.g. low angle up to 45° in any plane) see Figure 8.